

Review Article

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Therapies for Anterior Teeth Affected by MIH in Children and Adolescents: Two Case Reports

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ABSTRACT

Molar and incisor hypomineralization (MIH) is a qualitative defect in enamel development affecting first molars and permanent incisors, characterized by well-limited opacities of different color. Affected incisors cause aesthetic concerns, particularly in young patients, and are usually the reason for consultation. To manage the aesthetics of these teeth, several treatment options are available. This article presents the management of two patients who came to the Pedodontics Department of the Mohammed VI Center for Dental Care for aesthetic concerns, related to the presence of opacities in the maxillary central incisors associated with MIH.

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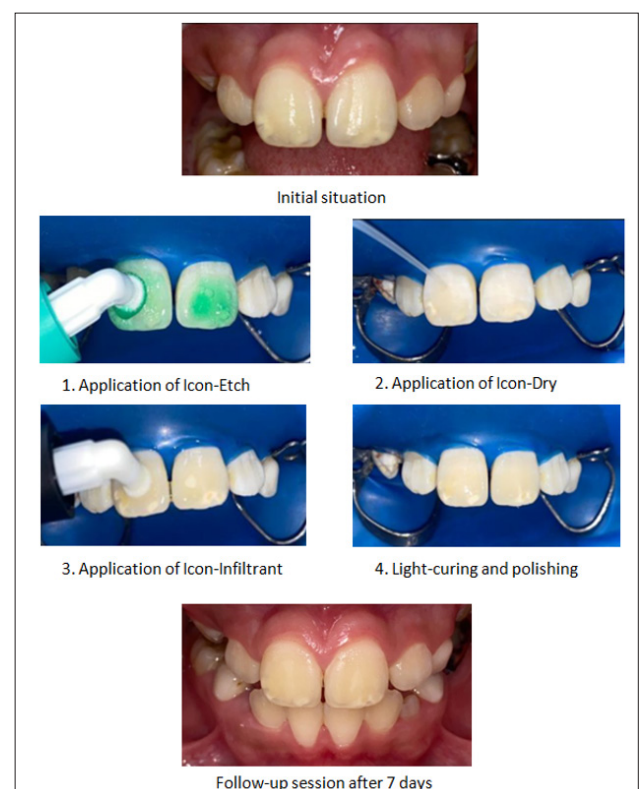
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Introduction

Management of the anterior area affected by MIH usually takes place after treating first permanent molars [1]. This aesthetic management often takes place towards the end of mixed dentition, a period where young patients begin to express concerns about unaesthetic discolorations [2]. Incisors affected by MIH require specific management. Indeed, histopathological data on MIH reveal that hypomineralization begins at the amelo-dentinal junction (ADJ) and not at the enamel surface, unlike other types of enamel defects. Thus, the internal location of this hypomineralization is a real challenge when trying to establish a treatment in accordance with tissue preservation [1,3].

Several approaches can be proposed for MIH-affected anterior teeth, such as external bleaching, micro-abrasion, resin infiltration, the Etch-Bleach-Seal technique, or a combination of these options. Restorative techniques can also be considered, with or without enamel removal. However, indirect techniques should only be used in adolescents [4]. We will illustrate some of these therapeutic approaches through two clinical cases managed at the Mohammed VI Center for Dental Care, whose incisors presented opacities related to MIH.



Case 1

The first case involved a 9-year-old female patient who came to the Centre Mohammed VI des soins dentaires for aesthetic reasons. The patient was bothered by stains on both maxillary central incisors (Figure 1). The diagnosis of MIH was made after examining the first permanent molars, which were also affected to varying degrees.

After prophylactic brushing, a sectorial dam was placed. Next, the resin infiltration procedure was initiated, starting with the application of Icon-Étch, with energetic etching for 2 minutes. Next, the product was suctioned off and the teeth were rinsed for 30 seconds, then dried with an air jet.

The second step consisted in applying Icon-dry for 30 seconds, followed by drying with an air jet. This step, which uses ethanol at 99%, removes the fluids trapped in the porosities of the hypomineralized stains, and also helps in predicting the aesthetic result after resin infiltration. In fact, if the opacities are similar to healthy enamel, we can proceed to the infiltration step, otherwise we return to the etching step with Icon-etch. In our case, as the opacities were not sufficiently covered, we added 3 cycles of etching with hydrochloric acid and drying with ethanol (Icon etch and Icon dry) for an optimal aesthetic result.

The maximum recommended number of Icon-etch etchings (3 times) was achieved. So the next step was to apply the infiltrating resin. This resin (Icon infiltrant) was applied to the tooth surfaces of 11 and 21 for 3 minutes, rubbing the material from time to time to allow it to infiltrate. Excess resin was then removed using an air jet, and the material was then light-cured for 40 seconds, followed by polishing. The patient was happy with the aesthetic result, she was then seen for a follow-up session after 7 days of treatment with stable outcomes.



Case 2

The second case involved a 13-year-old patient who came to the Mohammed VI center for dental care for aesthetic concerns involving the maxillary central incisors. Both the 11 and 21 incisors showed white opacities in the 1/3 incisal area, more pronounced in the 11 incisor. In this case, the opacities were whiter and more pronounced than in the first patient. Consequently, it was necessary to combine several therapies in order to optimize the aesthetic result while respecting the therapeutic gradient.

A sectorial dam was placed after a paste-free brushing procedure. This was followed by micro-abrasion technique using Opalustre paste. The micro-abrasion paste is then rubbed against the MIH stains using the specific application cup that comes with the Opalustre kit, set on a low-speed handpiece. The application should not exceed 10 seconds for each tooth, as recommended. Tooth surfaces were then thoroughly rinsed to remove all particles of

micro-abrasion paste, and dried with an air jet. These steps were repeated 3 times to allow access to the bottom of the MIH lesions. A minimal curettage was then performed at the bottom of the lesion, as it was still pronounced after 3 cycles of micro-abrasion, in order to optimize the aesthetic result.

In a second stage, deep resin infiltration was performed: application of Icon-Etch, then Icon-Dry, then Icon-Infiltrant. A deproteinization step with sodium hypochlorite for 1 minute was added after Icon-Etch etching to optimize adhesion to hypomineralized enamel. Finally, aesthetic composite layering was performed: first, adhesive was applied and cured, then an opaque composite was placed at the floor to mask residual opacities, followed by an A2-tinted enamel composite and then A1. The final step was polishing the composite restoration using abrasive discs and a silicone polishing tip.

Discussion

In the management of the anterior sector with MIH, we sometimes find situations where a single therapy is applied, although in most cases, the use of several approaches is necessary. When several therapeutic options are considered, it is judicious to start with the least invasive approach, and then evaluate the results in concert with the patient. If the result is unsatisfactory, it is always possible to explore more invasive approaches [5]. Following a “most conservative to least conservative” approach, Gil Tirlet and Jean-Pierre Attal have introduced a therapeutic gradient that adapts to each clinical situation. It enables the practitioner to choose from a wide range of therapeutic solutions, favouring those that cause the least damage to healthy dental tissue and preserve the natural anatomy of the teeth [6].

Micro-abrasion is a chemo-mechanical treatment involving the application of an acid and an abrasive agent to the affected tooth surface. It causes chemical erosion of the outer layer of affected enamel, making it a minimally invasive approach. This technique uses 18% HCl or 37% phosphoric acid, in combination with an abrasive paste [7,8]. The thickness of enamel removed varies, according to studies, from 20 to 200 µm, depending on the acid concentration and duration of application [9]. For best aesthetic results, micro-abrasion can be combined with other therapies. When combined with resin-infiltration, it can mask the “edge effect” that can sometimes occur after resin infiltration [10,11]. The same combination also dissolves superficial enamel, offering considerably improved aesthetic results during infiltration [12].

The resin infiltration technique, marketed under the name Icon® (DMG America Company), is described as a micro-invasive technology that fills, strengthens and stabilizes demineralized enamel without sacrificing healthy tooth structure [13]. It consists of an etching with 15-20% hydrochloric acid (Icon etch), an application of ethanol (Icon dry) and then the application of a monomer (Icon infiltrant) based on Triethylene glycol dimethacrylate TEGDMA [14]. The principle is to make the resin penetrate the porous enamel by capillary action, thereby blocking lesion progression by filling in the microporosities that constitute diffusion pathways for acids and dissolved materials, thus creating a diffusion barrier within the lesion [13,15]. It is considered a simple, minimally invasive technique that is suggested for all types of opacities. It has been shown to be effective in masking whitish opacities in MIH, but for yellow-brown opacities the results are limited [13-18]. This option is best suited to areas with shallow defects [19]. Indeed, the deeper the defect, the poorer the aesthetic result [20].

To avoid the “edge effect” after resin infiltration, it is recommended to combine this technique with external bleaching [10]. In a study by Schoppmeier et al. they showed that the camouflage ability of resin infiltration is improved with prewhitening of the teeth with a 25% hydrogen peroxide solution for two weeks [21]. The “deep resin infiltration” technique is often used for deep lesions [22]. This technique was described by Attal et al. and involves preparing the affected tooth using an intra-oral sandblasting device (air abrasion) to guarantee that the resin will reach the entire lesion in depth. After infiltration, composite can be added to the tooth surface. Aesthetic results with this technique are better in the long term, since the infiltrant is not in contact with the external environment [3,22,23].

Following the therapeutic gradient, direct composite restorations represent the final approach that can be used to treat MIH-affected

anterior teeth in children and adolescents. Dentists generally turn to this option when other less invasive therapies cannot be applied or do not provide satisfying results. However, the removal of hypomineralized enamel must be carried out as conservatively as possible, especially in the case of immature permanent incisors due to their particular pulpal anatomy (large pulp chamber) [17]. Some authors recommend the complete removal of hypomineralized enamel prior to placement of the composite restoration [19,24]. In fact, treatment success is significantly increased when hypomineralized enamel is completely removed [25]. However, it can weaken tooth structure, increasing the risk of restoration failure [26]. As a result, removal of all affected tissue is no longer indicated. In the case of deep lesions, it can lead to accidental pulp exposure and postoperative symptoms. In addition, selective removal of hypomineralized tissue has been shown to be a promising technique for teeth with MIH [26]. Several authors suggest pretreatment of hypomineralized enamel with sodium hypochlorite NaOCl, known for its denaturing properties, to remove the proteins encapsulating hydroxyapatite crystals [19-27]. This deproteinization, using 5% or 5.25% sodium hypochlorite for 1 minute after etching, improves bonding strength in hypomineralized enamel [3-25]. Several studies have reported that this deproteinization increases bonding values in the treatment of teeth affected by MIH [28-30]. It has also been shown that hypomineralized stains will have an appearance similar to normal enamel and dentin after deproteinization prior to resin infiltration [20]. However, hypochlorite is a powerful oxidizing agent that must be used with caution to avoid affecting soft tissues. Papain gel has therefore been proposed as an alternative to improve the bonding of adhesives to hypomineralized enamel [26].

Conclusion

MIH is a particularly complex and difficult dental condition to manage, especially in anterior teeth. The management of esthetics in young patients with MIH must be carried out in the most conservative way, respecting the concept of the therapeutic gradient of conservative treatments to remain within the principle of tissue economy. In any case, whatever therapeutic approach is chosen, the aesthetic result is never 100% certain, and medium- and long-term follow-up is necessary.

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